**2.7 – Freezing Point, Boiling Point, and Solubility Lab**

Purpose – to demonstrate and quantify the changes to the freezing and boiling points of water with the addition of solute.

Materials

- Ring stand - thermometer

- Utility clamp - stirring rod

- 250 mL beaker - 4 cups

Reagents

- Distilled water

- NaCl (sodium chloride)

- Ice

Procedure

**Part 1**

1. Number your cups 1, 2, 3, 4, and then add 5.0g of NaCl to each cup.
2. Fill a 250 mL beaker 2/3 full with crushed ice, then add water to the same level. Stir with a stirring rod.
3. Clamp a thermometer into the beaker and record the initial temperature of the ice water on the data table on the next page.
4. Add the 5.0g of NaCl from cup 1 to the ice-water mixture. Stir and record the temperature.
5. Next, add the 5.0g of NaCl from cup 2 to the ice-water-salt mixture. Stir and record the temperature.
6. Repeat the previous step with the salt from cup 3, and then from cup 4.

**Part 2**

1. Add 200 mL of distilled water to a beaker.
2. Add NOTHING to the beaker, but bring it to a boil and record its boiling temperature in the data table on the next page.
3. Let the beaker cool for couple of minutes. Add 5.0g of NaCl to the beaker, stir it in, and bring it to a boil again. Record the temperature.
4. Repeat step 3 adding another 5.0g of NaCl to the beaker, and again with yet another 5.0g of NaCl.

Data

**Part 1**

Table 1: Effect of sodium chloride on melting point of ice **General observations**

|  |  |
| --- | --- |
| **NaCl added (g)** | **Temperature of solution (°C)** |
| 0.0 |  |
| 5.0 |  |
| 10.0 |  |
| 15.0 |  |

**Part 2**

Table 2: Effect of sodium chloride on boiling point of water **General observations**

|  |  |
| --- | --- |
| **NaCl added (g)** | **Boiling Temperature (°C)** |
| 0.0 |  |
| 5.0 |  |
| 10.0 |  |
| 15.0 |  |

**Analysis Questions**

1. **What effect did salt have on the:**
   1. **Freezing point of water?**
   2. **Boiling point of water?**
2. **Predict why the salt has these effects.**
3. **Research why the salt has these effects.**

**Application Questions**

**How can the effects observed in this lab be used in the real world? Discuss two ways.**

**Application Extension (does not need to be answered on lab write up)**

**When salt gets onto our vehicles, does it actually increase the rate of rusting? Why or why not?**